International Journal of Agricultural Science and Research (IJASR) ISSN(P): 2250-0057; ISSN(E): 2321-0087 Vol. 6, Issue 2, Apr 2016, 327-340 © TJPRC Pvt. Ltd.



ICT -PROGRAMMING TOOL FOR CALCULATING MECHANICAL OR ENGINEERING MEASURES FOR SOIL EROSION CONTROL

PRADIP P KOLHE¹ & PRAKASH R KOLHE²

¹Assistant Professor, Department of Computer Science, ARIS Cell, Dr. PDKV, Akola, Maharashtra, India ²Assistant Professor & Officer Incharge, Dr PDKV Akola, Dr, BSKKV Dapoli, Maharashtra, India

ABSTRACT

In the Information Communication Technology (ICT) era, present scenario where software programming tool is utilize everywhere. The agriculture is backbone Indian Agriculture. Agricultural field is not untouchable from ICT era. More specifically, e-Agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communication technologies (IT) in the rural domain, with a primary focus on agriculture. Mechanical or Engineering methods depend upon manipulating the surface topography, for example, by installing terraces to control the flow of water. Mechanical measures are largely ineffective on their own because they cannot prevent detachment of soil particles. ICT-Programming Tool for Calculating Mechanical or Engineering Measures for Soil Erosion Control 'C' language programming a powerful tool for scientific community for Mechanical or Engineering Measures for Soil Erosion Control

This paper discuss the 'C' program to calculate Vertical interval, Horizontal interval, depth of cut in bench terracing, depth of water impounding before the bund, total bund height, Length of bund, Computation of flow velocity, Computation of catchment area of bund, Computation of peak runoff rate, Width of bench terrace, VI interval of bench terrace Area lost in contour bunding, length of bench terrace, Capacity of channel, Earthwork computation of bench terrace

KEYWORDS: ICT, E-Agriculture, Mechanical or Engineering, Vertical Interval, Horizontal Interval

Received: Mar 15, 2016; Accepted: Mar 30, 2016; Published: Apr 08, 2016; Paper Id.: IJASRAPR201645

INTRODUCTION

In the Information Communication Technology (ICT) era, present scenario where software programming tool is utilize everywhere. The agriculture is backbone of this our country. Agricultural field is not untouchable from ICT era. E-Agriculture is an emerging field focusing on the enhancement of agricultural and rural development through improved information and communication processes. More specifically, e-Agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communication technologies (IT) in the rural domain, with a primary focus on agriculture.

Indian Agriculture contributes to 18.6 per cent of India's GDP, and approximately 59 per cent Indians for Soil is most precious gift of nature - Prime resource - for food, fodder etc. Soils mismanage- less productivity. In India, more than 100 million hectares -soil degraded, eroded, and unproductive. About 17 tonnes/ha soil detached annually-20% of this is transported by river to sea, 10% deposited in reservoir results 1 to 2% loss off storage capacity. Soil erosion deteriorates soil quality & reduces productivity of natural agricultural, Soil erosion deteriorates

www.tjprc.org editor@tjprc.org

quality of water, and increased sedimentation causes reduction of carrying capacity of water.

Mechanical or Engineering methods depend upon manipulating the surface topography, for example, by installing terraces to control the flow of water. Mechanical measures are largely ineffective on their own because they cannot prevent detachment of soil particles. Their main role is in supplementing agronomic measures, being used to control the flow of any excess water that arises. Mechanical methods, including bunds, terraces, waterways, and structures such as vegetative barriers or stone lines installed on farm also can break the force of winds or decrease the velocity of runoff to reduce soil erosion.

Bunding is an engineering soil conservation measure used for retaining the water, creating obstruction, and thus controlling the soil erosion. ICT–Programming Tool for Calculating Mechanical or Engineering Measures for Soil Erosion Control 'C' language programming a powerful tool for scientific community for Mechanical or Engineering Measures for Soil Erosion Control

This paper discuss the 'C' program to calculate Vertical interval, Horizontal interval, depth of cut in bench terracing, depth of water impounding before the bund, total bund height, Length of bund, Computation of flow velocity, Computation of catchment area of bund Computation of peak runoff rate, Width of bench terrace, VI interval of bench terrace Area lost in contour bunding, length of bench terrace, Capacity of channel, Earthwork computation of bench terrace

MATERIALS AND METHODS

The methodology used to mechanical or engineering measures for soil erosion control. It includes different formulae and theoretical considerations. It also encapsulates the configuration of the system.

Configuration of the System

Desktop System , $Intel^{®}$ Pentium $^{®}$ 4, 2.0 GHz ,1 GB DDR 2-RAM, Intel 845 Series Motherboard , AGP card, Windows TM XP Professional Windows Development

About the platform

For the different parameter of bund and terracing calculations using C language Version 3.0 Turbo c ++ copyright (c) 1990, 1992 by Borland International, Inc. following different formulae are used.

Different Parameter Calculation of Bunding and Terracing

Different Parameters of Bunding

• Vertical interval

$$V.I = (((S/3) +2)*0.3)$$

Horizontal interval H.I= (V.I/S)*100

• Depth of water impounding before the bund (h)

$$h=\sqrt{(VI*R)/500}$$

L= (10000/HI) Where, L= Length of bund (m) HI= Horizontal interval (m)

• Computation of flow velocity (V) $V = (R^{2/3} * S^{1/2})/n$ Where,

V=Flow velocity (m/s) S=Slope of field (%) R=Hydraulic radius (m)

A= HI*Length of bund

Computation of peak runoff rate by rational method (Q)

Q=CIA/360

• Area lost due to contour bunding (A_L)

 $A_L = (1.3*S*b)/VI$

VI= Vertical interval between bund (m)

Different Parameters of Terracing

• Depth of cut in bench terracing

D = (W*S/100)

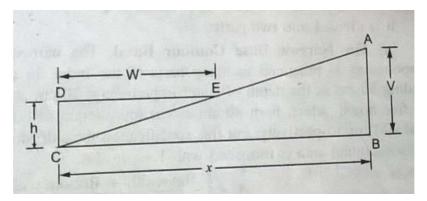


Figure 1: Basic Diagram for Bund

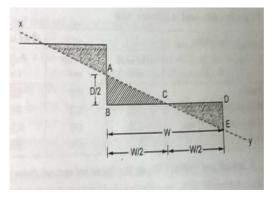


Figure 2: Width of Bench Terrace

C' Source Code for Parameter Calculations

// program developed by Dr P R Kolhe ,P P Kolhe at Dr BSKKV,Dapoli and Dr PDKV akola

#include <stdio.h>

#include<math.h>

#include<conio.h>

<u>www.tjprc.org</u> editor@tjprc.org

```
#define g 9.81
#define tan45 1
void main()
float HI, VI, Al, b, S, L, w R, Q V, A, C, I, W, D, h, d, T, F, n, E,
int kk, choice = 0;
while (choice!=16)
{
printf("\n\t\t\t**** DEPARTMENT OF SWCE***\n");
printf("\t Mechanical or Engineering measures for soil erosion control \n\n");
printf("\t\t 1. Vertical interval VI=(0.3*((S/3)+2)) \n");
printf("\t\t 2.Horizontal interval HI=((VI/S)*100) \n");
printf("\t\t 3.depth of cut in bench terracing D=((W*S)/100) \n");
printf("\t 4.Depth of water impounding before the bund h=sqrt(VI*R)/50 \n");
printf("\t\t 5.Total bund height T=(h+d+F)\n");
printf("\t\t 6.Length of bund L=10000/HI\n");
printf("\t 7.Computation of flow velocity V=pow(R,0.66)*pow(S,0.5)/n \n");
printf("\t\t 8.Computation of catchment area of bund A=HI*L \n");
printf("\t\t 9.Computation of peak runoff rate Q=C*I*A/360 \n");
printf("\t\t 10.Width of bench terrace W=((200*D)/S)\n");
printf("\t\t 11.VI interval of bench terrace VI=((W*S)/(100-S)); \n");
printf("\t\t 12.Area lost in contour bunding Al=(1.3*S*b)/VI \n");
printf("\t\t 13.length of bench terrace L=((10000)/(W+VI)) \n");
printf("\t\t 14.Capacity of channel Q=(A*V) \n");
printf("\t\t 15.Earthwork computation of bench terrace E=(100*W*S)/8 \n");
printf("\n\t 16.EXIT \n");
printf("\n\t ENTER YOUR CHOICE <1 -16>");
scanf("%d",&choice);
```

ICT -Programming Tool for Calculating Mechanical or Engineering Measures for Soil Erosion Control

```
case 1: /* Vertical interval */
{
clrscr();
printf("\n\t\t **** 1.Vertical interval ***\n\ ");
scanf("%f",&S);
printf(" \n\t\t Output values for vertical interval==>\n");
VI=(0.3*((S/3)+2));
printf("\n\t\t the vertical interval V.I(m)=%5.2f",VI);/*For print press print key*/
getch(); clrscr(); break; }
case 2 : /* Horizontal interval */
scanf("%f",&VI);
printf("\t\t Enter the value of slope(%)S=");
scanf("%f",&S);
printf("\n\t\tOutput values for horizontal interval==>\n");
HI=((VI/S)*100);
printf("\n\t\t the horizontal interval H.I(m)=%5.2f",HI);/*For print press print key*/ break;
case 3: /* Depth of cut in bench terracing */
scanf("%f",&W);
D=((W*S)/100);
printf("\n\t\t Depth of cut in bench terrace D(m)=\%5.2f",D);
/*For print press print key*/
getch();
break;
case 4: /* Depth of water impounding before the bund(h) */
clrscr();
```

www.tjprc.org editor@tjprc.org

```
h=sqrt((VI*R)/50);
getch();
break;
}
case 5: /* Total bund height */
{
scanf("%f",&F);
T=(h+d+F);
}
case 6: /* Length of bund */
clrscr();
L=(10000/HI);
getch(); break;
case 7: /*Computation of flow velocity */
{
clrscr();
V = pow(R, 0.66)*pow(S, 0.5)/n;
getch(); break; }
case 8: /*computation of catchment area of bund */
A=HI*L;
getch();
break;
case 9: /*Peak runoff rate */
scanf("%f",& I);
```

ICT -Programming Tool for Calculating Mechanical or Engineering Measures for Soil Erosion Control

```
scanf("%f",&A);
Q=C*I*A/360;
getch();
break;
}
case 10: /* Width of bench terrace */
{
scanf("%f",&S);
printf("\n\tOutput values for width of bench terrace =\n");
W = ((200*D)/S);
printf("\n\t\t width of bench terrace (m)=%5.2f",W);/*For print press print key*/
getch();
break;
}
case 11: /* Vertical interval of bench terrace */
scanf("%f",&W);
scanf("%f",&S);
printf("\n\tOutput values for VI of bench terrace=\n");
VI=((W*S)/(100-S));
getch(); break; }
case 12: /* Area lost due to contour bunding */
{
clrscr();
scanf("%f",&b); scanf("%f",&S); scanf("%f",&VI);
Al=(1.3*S*b*100)/VI;
getch(); break; }
case 13: /*Length of bench terrace */
{ clrscr();
```

www.tiprc.org editor@tjprc.org

```
scanf("%f",&W);
                         scanf("%f",&VI);
L=((10000)/(W+VI));
getch(); break; }
case 14: /*Capacity of channel*/
                 printf("\n\n\t\t*** 14.Capacity of channel***\n");
{ clrscr();
scanf("%f",&V);
Q = (A*V);
break; }
case 15: /* Earthwork computation for bench terrace */
scanf("%f",&W);
                         scanf("%f",&S);
E=(100*W*S)/8;
getch();
break; }}} //end
```

RESULTS AND DISCUSSIONS

With the guideline to use the different parameters calculator for mechanical measures for soil erosion control the programme is prepared in the C language Version 3.0 Turbo c ++. The details of the different parameters calculator for mechanical measures for soil erosion control are shown in the main page.

Output Screen of "C" Program

```
Mechanical or Engineering measures for soil erosion control

1.Vertical interval VI=(0.3*((S/3)+2))
2.Horizontal interval HI=((VI/S)*100)
3.depth of cut in bench terracing D=((W*S)/100)
4.Depth of water impounding before the bund h=sqrt(VI*R)/50
5.Total bund height T=(h+d*F)
6.Length of bund L=10000/HI
7.Computation of flow velocity U=pow(R,0.66)*pow(S,0.5)/n
8.Computation of catchment area of bund A=HI*L
9.Computation of peak runoff rate Q=C*I*A/360
10.Width of bench terrace W=((200*D)/S)
11.UI interval of bench terrace U=((W*S)/(180-S));
12.Area lost in contour bunding AI=(1.3*S*b)/UI
13.length of bench terrace L=((10000)/(W+UI))
14.Capacity of channel Q=(A*U)
15.Earthwork computation of bench terrace E=(100*W*S)/8

16.EXIT

EYTER YOUR CHOICE (1 -16)
```

Figure 3

Main page: Option Window

Programme Output for Vertical Interval

```
*** 2.Horizontal interval***

Input values for horizontal interval==>

Enter the value of vertical interval(m)VI=1
Enter the value of slope(%)S=5

Output values for horizontal interval==>
the horizontal interval H.I(m)=20.00_
```

Figure 4

Figure 5

```
*** 4.Depth of water impounding before the bund ***

Input values for depth of water impounding before the bund==>

Enter the value of UI(m)VI=0.75

Enter the value of maximum rainwater on area basis(m)R=0.80

Output values for depth of water impounding before the bund==>

the depth of water impounding before the bund(m)= 0.11
```

Figure 6

```
Input values for total bund height==>

Enter the value of depth of water impounding before the bund(cm)h=11

Enter the value of depth of flow over outlet(cm)d=30 Enter the value of freeboard as 250f h F=3

Output value for total bund height==>
the total height(cm)=44.00_
```

Figure 7

www.tjprc.org editor@tjprc.org

*** 15.earthwork computation for bench terrace***

Input values for earthwork computation for bench terrace==>
Enter the value of width of terrace(m)W=25
Enter the value of land slope (%)S=5

Output values of earthwork==>
earthwork for bench terrace E(/ha)=1562.50_

Figure 8

*** 6.Length of bund per hectare***

Input values Length of bund per hectare ==>

Enter the value ofhorizontal interval(m)HI=25

Output value for length of bund per hectare ==>

Length of bund per hectar(m)=400.00

Figure 9

*** 8.Computation of area of bund***

Input values for computation of area of bund==>

Enter the value of HI(m) HI=25

Enter the value of length of bund(m)=400

Output values for computation of area of bund =

computation of area of bund(m2)=10000.00

Figure 10

*** 9.Computation of peak runoff rate***

Input values for constant==>

0.6

Enter the value of rainfall intensity (mm/hr)I=150

Enter the value of area of watershed (ha) A=1.4

Output values for computation of peak runoff rate =

computation of peak runoff rate Q(m3/s)= 0.35

Figure 11

*** 10.Width of bench terrace***

Input values for width of bench terrace =n

of cut (m)D=1.5

Enter the value of slope of field (%)

Output values for width of bench terrace =

width of bench terrace (m)=15.00

Figure 12

*** 14.Capacity of channel***

Input values capacity of channel==>
Enter the value for cross sectional area of channel (m^2)A=4000
Enter the value for velocity(m/s)V=2

Output values for capacity of channel==>

capacity of channel (m^3/s)=8000.00

Figure 13

*** 11.Vertical interval of bench terrace***

Input values for vertical interval of bench terrace =n Enter the value of width of terrace(m)W=14

Enter the value of slope of field (%) S15

Output values for VI of bench terrace=

VI of bench terrace V.I(m)= 2.47

Figure 14

<u>www.tjprc.org</u> editor@tjprc.org

*** 12. Area lost due to contour bunding***

Input values for area lost by contour bunding==> Enter the value of base width of bund(m)b=1.25

Enter the value of slope of field (%)S=5

Enter the value of VI(m)=1.25

Output values for VI of bench terrace=

area lost due to contour bunding (m2)=650.00

Figure 15

*** 13.Length of bench terrace***

Input values length of bench terrace==>
Enter the value of width of bench terrace(m)W=14

Enter the value of VI(m)VI=2.5

Output values for length of bench terrace=

length of bench terrace(m)=606.06_

Figure 16

*** 15.earthwork computation for bench terrace***

Input values for earthwork computation for bench terrace==>
Enter the value of width of terrace(m)W=25
Enter the value of land slope (%)S=5

Output values of earthwork==>

earthwork for bench terrace E(/ha)=1562.50_

Figure 17

CONCLUSIONS

This program is useful for calculating the Mechanical measures for soil erosion control i. e. bunding and terracing are good practices for controlling the soil erosion.

REFERENCES

- 1. Computer Graphics by Chennakesava Alavala
- 2. Computer Graphics by Steven Harrington
- 3. Soil and Water Conservation Engineering by Dr. R. Suresh
- 4. E Balagurusamy, 1989 Programming in ANSI C (4E) Tata Mc Graw-Hill Publisher, New Delhi
- 5. Y. Kanetkar Lets C
- 6. Prof. T I Eldho, Department of Civil Engineering, IIT Bombay. Watershed management Module 2 (L6) Sustainable Watershed Approach & Watershed Management Practices.
- 7. Kunwar Jalees (1985) LOSS OF PRODUCTIVE SOIL IN INDIA Inum. J. Em'ironment,, 1 SIIIdies. Vol. 24. pp.245-250

www.tiprc.org editor@tjprc.org